

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESEARCH AND TECHNOLOGY RESUME

## TITLE

ASTEROID SHAPES AND POLE ORIENTATIONS FROM VISUAL AND INFRARED PHOTOMETRY

## PERFORMING ORGANIZATION

Jet Propulsion Laboratory  
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## INVESTIGATOR'S NAME

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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

- a. **STRATEGY:** To obtain visual and infrared lightcurves of Pluto-Charon mutual eclipse event lightcurves and to analyze them to derive models of the Pluto-Charon system, including separations, relative sizes, some orbital parameters, system density, and an albedo map of the hemisphere of Pluto facing Charon.
- b. **ACCOMPLISHMENTS:** We have obtained observations of Pluto-Charon mutual events with the Palomar 1.5 and 5-meter, Kitt Peak 1.3-meter, and NASA IRTF 3-meter telescopes. IRAS survey observations of Pluto were combined with the results of our eclipse models to show that the thermal flux observed by IRAS cannot be explained using the standard thermal model for atmospherless solar system bodies but can be explained if Pluto behaves as an isothermal body, e.g., as would be the case if it had a thermally significant atmosphere (Tedesco *et al.*, 1987). A water frost spectrum of Charon was obtained (Buie *et al.*, 1987) and IR lightcurves of two asteroids were used to demonstrate that their visual lightcurves were due primarily to their irregular shapes (Lebofsky *et al.*, 1988).
- c. **ANTICIPATED ACCOMPLISHMENTS:** We will make additional visual and infrared mutual event lightcurve observations, develop second order eclipse and infrared models, publish the observational results from the previous three years, hold a fourth Pluto Workshop at the 1988 DPS meeting, and continue coordination of the international campaign and publication of the Pluto newsletter.

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**d. PUBLICATIONS:**

Buie, M.W., Cruikshank, D.P., Lebofsky, L.A., and Tedesco, E.F. (1987).  
Water frost on Charon. *Nature* 329, 522-523.

Lebofsky, L.A., Greenberg, R., Tedesco, E.F., and Veeder, G.J. (1988).  
Infrared lightcurves of asteroids 532 Herculina and 45 Eugenia: Proof of  
the absence of significant albedo markings. *Icarus*, in press.

Tedesco, E.F., Veeder, G.J., Dunbar, R.S., and Lebofsky, L.A. (1987). IRAS  
constraints on the sizes of Pluto and Charon. *Nature* 327, 127-129.